

CLAIMS

THAT WHICH IS CLAIMED IS:

- 5 1. An adhesive composition comprising:
 - (1) at least one copolymer comprising repeating units from ethylene and at least one α -olefin;
 - (2) at least one tackifier resin;
 - (3) at least one grafted polyolefin; and
- 10 wherein said adhesive composition has an onset of fiber tear of less than about 35°F.
- 15 2. An adhesive composition according to Claim 1 wherein said α -olefin has from 3 to about 12 carbon atoms.
- 20 3. An adhesive composition according to Claim 2 wherein said α -olefin is selected from the group consisting of 1-propene, 1-butene, isobutylene, 1-hexene, 4-methyl-1-pentene, and 1-octene.
- 25 4. An adhesive composition according to Claim 1 wherein said copolymer has a density ranging from about 0.85 g/ml to about 0.92 g/ml.
5. An adhesive composition according to Claim 1 wherein said copolymer is linear or substantially linear and produced by at least one metallocene catalyst or single-site catalyst.
6. An adhesive composition according to Claim 1 wherein said copolymer is branched.

7. An adhesive composition according to Claim 1 wherein said tackifier resin is at least one selected from the group consisting of aliphatic resins, cycloaliphatic resins, aromatic hydrocarbon resins, mixed aliphatic-aromatic resins, polyterpenes, aromatically modified terpene resins, rosins, rosins
5 esters, and hydrogenated rosin esters, and mixtures thereof.

8. An adhesive composition according to Claim 7 wherein said tackifier resin is partially or fully hydrogenated.

10 9. An adhesive composition according to Claim 7 wherein said tackifier resin is modified by a modifier selected from the group consisting of homopolymers, copolymers and terpolymers of ethylene, ethylene vinyl acetate, n-butyl acrylate copolymers, ethylene methacrylate copolymers, ethylene acrylic acid copolymers, and triblock, diblock, and multiblock
15 copolymers.

10. An adhesive composition according to Claim 7 wherein said tackifier resin is at least one hydrogenated hydrocarbon resin.

20 11. An adhesive composition according to Claim 7 wherein said tackifier resin is at least one partially hydrogenated cycloaliphatic hydrocarbon resin.

12. An adhesive composition according to Claim 7 wherein said tackifier resin has a Ring and Ball softening point ranging from about 70°C to about
25 150°C.

13. An adhesive composition according to Claim 7 wherein said tackifier resin has a viscosity at 177°C, as measured using a Brookfield viscometer, of less than or equal to about 5,000 centipoise.
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14. An adhesive composition according to Claim 1 wherein said grafted polyolefin is produced by grafting at least one polyolefin with at least one unsaturated polycarboxylic acid, anhydride, or ester thereof.

5 15. An adhesive composition according to Claim 14 wherein said polyolefin comprises repeating units from olefins containing at least 2 carbon atoms.

16. An adhesive composition according to Claim 15 wherein said polyolefin is at least one selected from homopolymers and copolymers comprising
10 repeating units from at least one monomer selected from ethylene, propylene, 1-butene, 4-methyl-1-pentene, 3-methyl-1-butene, 4,4-dimethyl-1-pentene, 3-methylpentene-1, 4-methylhexene-1, 5-ethylhexene-1, 6-methylheptene-1, 1-hexene, 1-heptene, 1-octene, 1-nonene, 1-decene, or 1-dodecene.

15 17. An adhesive composition according to Claim 14 wherein said grafted polyolefin is produced by a reaction of said polyolefin with an unsaturated polycarboxylic acid, anhydride or ester in the presence of a free radical source.

20 18. An adhesive composition according to Claim 17 wherein said polyolefin is a low viscosity polyolefin.

25 19. An adhesive composition according to Claim 17 wherein said free radical source is selected from the group consisting of peroxides, azo compounds, and irradiation sources.

20. An adhesive composition according to Claim 19 wherein said free radical source is selected from the group consisting of ditertiary butyl peroxide, tertiary butyl hydroperoxide, cumene hydroperoxide, *p*-methane peroxide, *p*-methane hydroperoxide compounds, azobis(isobutyronitrile), cobalt, uranium, thorium, and ultraviolet light.

21. An adhesive composition according to Claim 20 wherein the amount of said free radical source ranges from about 0.01% to about 0.5% by weight based on the weight of the polyolefin.

22. An adhesive composition according to Claim 14 wherein the amount of said polycarboxylic acid, anhydride or ester thereof ranges from about 1% by weight to about 10% by weight based on the weight of said polyolefin.

23. An adhesive composition according to Claim 14 wherein said polycarboxylic acid or anhydride is at least one selected from the group consisting of maleic acid, maleic anhydride, fumaric acid, citraconic anhydride, aconitric anhydride, itaconic anhydride, and mixtures thereof.

24. An adhesive composition according to Claim 14 wherein said polycarboxylic ester is at least one selected from the group consisting of half or full esters derived from methyl maleate, ethyl maleate, dimethyl maleate, dimethyl fumarate, methyl ethyl maleate, dibutyl maleate, and dipropyl maleate, or those compounds which form these compounds at elevated reaction temperatures such as citric acid.

25. An adhesive composition according to Claim 14 wherein said grafted polyolefin is produced in an extruder or a Banbury mixer.

26. An adhesive composition according to Claim 14 wherein said grafted polyolefin has been reacted with at least one polycarboxylic acid, anhydride, or ester thereof such that the saponification number of the grafted polyolefin is about 3 to about 60.

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27. An adhesive composition according to Claim 14 wherein said grafted polyolefin has a viscosity of about 350 to about 15,000 centipoise at 150°C.

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28. An adhesive composition according to Claim 14 wherein said grafted polyolefin has a melt index ranging from about 100 to about 5,000 g/10 min at 190°C.

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29. An adhesive composition according to Claim 1 wherein the amount of said copolymer ranges from about 30% by weight to about 80% by weight based on the weight of the adhesive composition.

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30. An adhesive composition according to Claim 1 wherein the amount of said grafted polyolefin ranges from about 2% by weight to about 25% by weight based on the weight of the adhesive composition.

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31. An adhesive composition according to Claim 1 wherein the amount of said tackifier resin ranges from about 15% by weight to about 45% by weight based on the weight of the adhesive composition.

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32. An adhesive composition according to Claim 1 further comprising at least one additive selected from the group consisting of reinforcing agents, fire retardants, foaming agents, conventional tackifiers, plasticizers, oils, antioxidants, polymers, curable/reactive monomers, crosslinking agents, fillers, dyes and pigments.

33. An adhesive composition according to Claim 32 wherein said antioxidant is at least one selected from the group consisting of hindered phenols and multifunctional phenols.

5 34. An adhesive composition according to Claim 33 wherein said antioxidant is at least one selected from the group consisting of 4,4'-thiobis (6-tert-butyl-o-cresol); 6-(4-hydroxyphenoxy)-2,4-bis(n-octyl-thio)-1,3,5 triazine; 1,3,5-trimethyl-2,4,6-tri-(3,5-ditertbutyl-4-hydroxybenzyl)benzene; 2,6-ditertbutylphenol; zinc dibutyl dithiocarbamate; 4,4'-methylene-bis-(2,6-
10 di-tert-butylphenol); tetrakis[methylene-3-(3',5'-di-t-butyl-4-hydroxyphenyl)-propionate]-methane; pentaerythritol tetrakis-3(3,5-di-tert-butyl-4-hydroxyphenyl)-propionate; lauryl stearyl thiodipropionate; sorbitol hexa[3-(3,5-di-tert-butyl-4-hydroxy-phenyl)-propionate]; dilauryl 3,3'-
15 thiodipropionate; 2,6-di-tert-butyl-p-cresol; octadecyl-3-(3,5-di-tertbutyl-4-hydroxyphenol)-propionate and the mixtures thereof.

35. An adhesive composition according to Claim 1 wherein the onset of fiber tear for said adhesive composition is in a range of less than about 25°F.

20 36. An adhesive composition according to Claim 35 wherein the onset of fiber tear for said adhesive composition is in a range of less than about 15°F.

25 37. An adhesive composition according to Claim 1 wherein said adhesive composition has a peel adhesion failure temperature greater than about 110°F.

38. An adhesive composition according to Claim 37 wherein said adhesive composition has a peel adhesion failure temperature in a range of from 110°F to 150°F.

5 39. An adhesive composition according to Claim 1 wherein said adhesive composition has a shear adhesion failure temperature greater than about 180°F.

10 40. An adhesive composition according to Claim 39 wherein said adhesive composition has a shear adhesion failure temperature in a range from 180°F to 240°F.

15 41. A process for producing an adhesive composition, said process comprising contacting at least one copolymer comprising repeating units from ethylene and at least one α -olefin, at least one tackifier resin, and at least one grafted polyolefin.

20 42. A process according to Claim 41 wherein said contacting is conducted at a temperature ranging from about 160°C to about 200°C.

25 43. A process to produce an adhesive composition, said process comprising contacting at a temperature in a range of about 160°C to about 200°C at least one copolymer comprising repeating units from ethylene and at least one α -olefin, maleated polyethylene, and at least one hydrogenated hydrocarbon resin to produce said adhesive composition; wherein said copolymer has a density from about 0.85 g/ml to about 0.92 g/ml.

30 44. A process according to Claim 43 wherein said hydrogenated hydrocarbon resin is cycloaliphatic.

45. A process to produce an adhesive composition, said process comprising: 1) heating at least one copolymer comprising repeating units from ethylene and at least one α -olefin, maleated polyethylene, and at least one tackifier resin at a temperature in a range of about 160°C to about 200°C; 2) mixing said copolymer, said maleated polyethylene, and said tackifier resin to produce said adhesive composition.

46. A process according to Claim 45 wherein said copolymer has a density ranging from about 0.85 g/ml to about 0.92 g/ml.

47. A process according to Claim 46 wherein said tackifier resin is a hydrogenated hydrocarbon resin.

48. An article comprising said adhesive composition of Claim 1 and a substrate.

49. An article according to Claim 48 wherein said article is a cardboard box or package.

50. A process for producing an article comprising contacting said adhesive composition with at least one substrate to produce said article.

51. A process according to Claim 50 wherein said substrate is selected from the group consisting of paper, corrugated board, chip board, cardstock films, and filmic materials.